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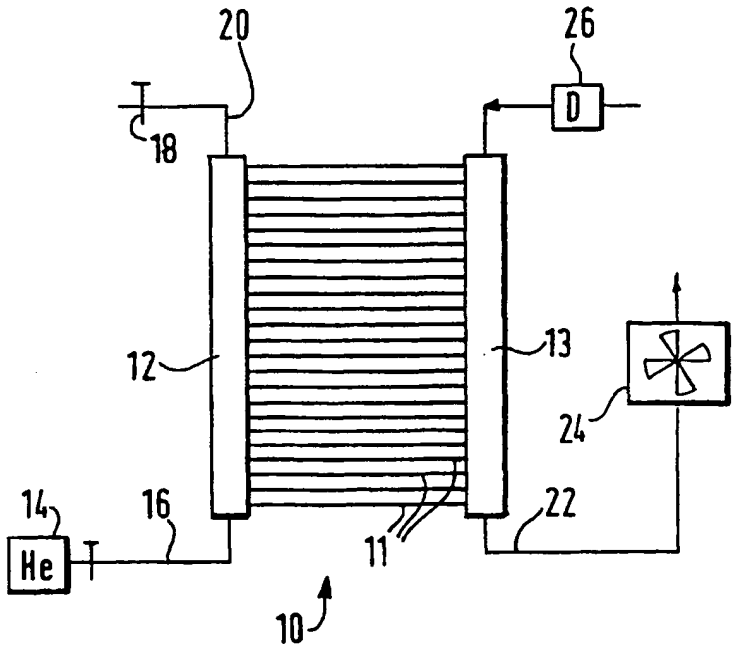
(54) Title: DETECTION OF LEAKS IN HEAT EXCHANGERS



(57) Abstract: A method for detection of leaks in a plate pack heat exchanger having respective discrete first and second flow paths in mutual thermal contract comprises connecting a helium detector probe at one end of the first flow path and an air compressor means at the other end of the first flow path, introducing helium to the second flow path, allowing air to pass through the first flow path under the influence of the compressor means and detecting any helium present therein by the helium detector probe, the pressure of the second flow path being higher than that of the first flow path.

WO 01/42756 A1

DETECTION OF LEAKS IN HEAT EXCHANGERS

This invention relates to heat exchangers and in particular provides an improved method for detection of leaks in plate pack heat exchangers, especially for use in the food and drinks industry.

British Patent No. 2314421 describes a method of testing a plate pack heat exchanger for leaks, the heat exchanger having discrete first and second flow paths in thermal contact, the method comprising connecting a gas circulation system including a helium detector probe across the first flow path; emptying the second flow path of any liquid and introducing helium; and using the helium detection probe to detect any helium in the first flow path.

While the method described in my earlier British patent represents a way of using commercially-available helium detectors to test heat exchangers for leaks in a simple and economical manner, it has been found in practice that detection times are slow, typically around 20 minutes from introduction of the helium, or even several times longer if any residual water is present in the second flow path, requiring the helium to diffuse through the water or other liquid.

It is an object of the present invention to provide a method for detection of leaks in heat exchangers and which provides a faster result, in that the absence of leaks can be reliably determined after only a few minutes, rather than having to wait for at least 20 minutes, especially when used in the presence of water or other liquid.

Accordingly, the present invention provides a method for detection of leaks in a plate pack heat exchanger having respective discrete first and second flow paths in mutual thermal contract, the method comprising connecting a helium detector probe at one end of said first flow path and an air compressor means at the other end of said first flow path, introducing helium to said second flow path, allowing air to pass through said first flow path under the influence of the compressor means and detecting any helium present therein by the helium detector probe, the pressure of the second flow path being higher than that of the first flow path.

In using the method of the present invention, the air compressor preferably operates at relatively low pressures, sufficient to drive air at from 15 to 30 cu. ft./min. through the first flow path against an outlet of atmospheric pressure. By using an open-ended flow path for the detection probe, a faster and more accurate result is achieved compared with the prior

art method in that the helium detected is quantitatively representative of the scale of the leak, whereas in the prior art method the helium concentration increases as it accumulates in the closed recirculating system.

Desirably, both flow paths are emptied of as much liquid as possible before carrying out the method of the invention although fast response times are still achieved in the presence of water. The second flow path, containing the introduced helium, is also preferably open-ended, more preferably with a flow restrictor or throttle, at the downstream end, whereby the helium or helium-containing gas bleeds through the secondary flow path under a positive pressure, to enhance leak-detection effectiveness while forming a dynamic rather than a static system. The pressure at which the helium is introduced preferably does not exceed 20 psig.

The helium detector probe preferably detects helium present in the primary flow path on the basis of thermal conductivity.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawing, which illustrates schematically one form of leak detection apparatus applied to a heat exchanger.

In the drawing, the heat exchanger is shown generally at 10 and includes heat exchange elements in the form of plates 11 extending between primary and secondary chambers 12, 13 respectively. The chambers have inlets and outlets (not shown) for supply and removal of heat exchange liquids. The chambers are in thermal contact with each other via the plates but are intended to be isolated from each other for mass transfer.

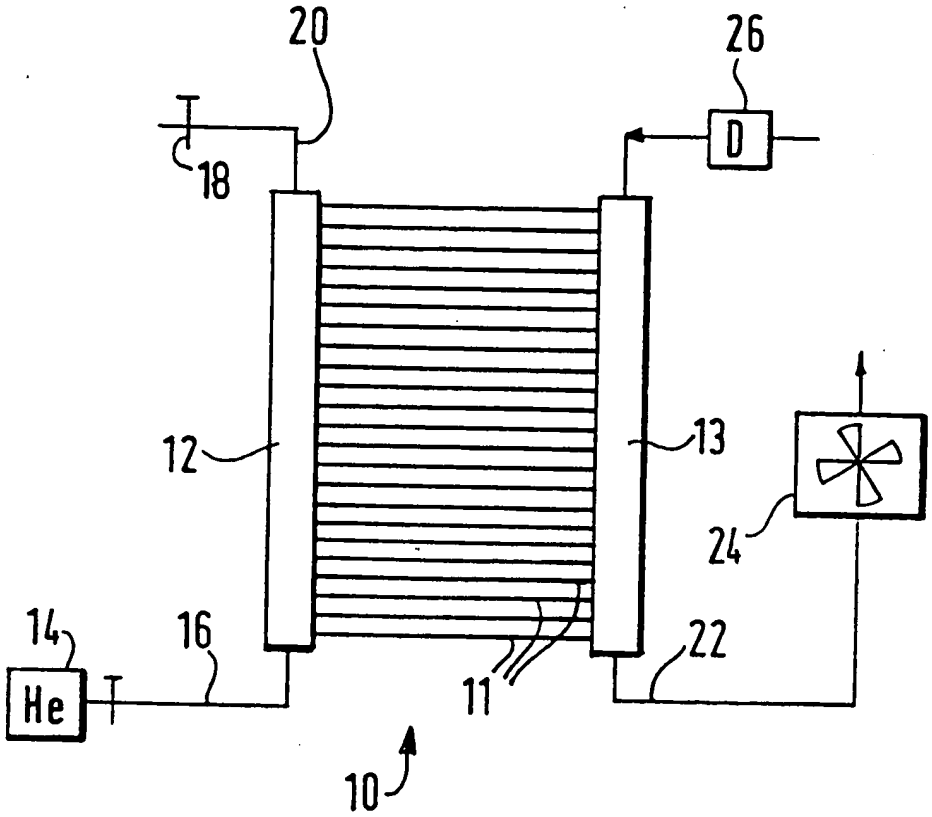
For the purpose of leak detection, the primary chamber 12 is provided at one end with a source of helium gas 14 and a supply line 16. At the other end of the chamber 12 is provided a tap 18 disposed in a take-off line 20. The secondary chamber 13 is provided at one end with an air pressure supply line 22 connected to a compressor 24 and at the other end with a helium detector probe 26.

In use and following removal of the heat exchange liquids from the primary and secondary chambers, the compressor 24 is started and flow of air at atmospheric pressure through the secondary chamber is established. Helium is them introduced in the primary chamber and allowed to flow out though the tap 18 in the open condition. The tap is then partially closed so that helium continues to flow through the primary chamber under a moderate

positive pressure. Helium will flow through any leaks between the primary and secondary chambers under the influence of the differential pressure therebetween and will be detected by the detector probe 26. Detection of any leaked helium can be expected to take place after approximately 5 minutes of operation, even in the presence of water.

Claims

1. A method for detection of leaks in a plate pack heat exchanger having respective discrete first and second flow paths in mutual thermal contract, the method comprising connecting a helium detector probe at one end of said first flow path and an air compressor means at the other end of said first flow path, introducing helium to said second flow path, allowing air to pass through said first flow path under the influence of the compressor means and detecting any helium present therein by the helium detector probe, the pressure of the second flow path being higher than that of the first flow path.
2. A method according to claim 1, in which the air compressor operates at a pressure sufficient to drive air at from 15 to 30 cu. ft./min. through the first flow path against an outlet of atmospheric pressure.
3. A method according to claim 1 or claim 2, in which the second flow path is substantially emptied of liquid before introduction of helium therein.
4. A method according to claim 1 or claim 2, in which both flow paths are substantially emptied of liquid.
5. A method according to any preceding claim, in which the second flow path is also open-ended.
6. A method according to claim 5, in which the second flow path is provided with a flow restrictor or throttle at the downstream end.
7. A method according to any preceding claim, in which the pressure at which the helium is introduced does not exceed 20 psig.
8. A method according to any preceding claim, in which the helium detector probe detects helium present in the primary flow path on the basis of thermal conductivity.
9. A heat exchange comprising discrete first and second flow paths in mutual thermal contact, the heat exchanger including a helium detector probe at one end of said first flow path and an air compressor means at the other end of said first flow path and a source of helium connected to said second flow path.
10. A heat changer according to claim 9, including means to maintain the pressure in said second flow path higher than the pressure in said first flow path.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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01M3/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 425 264 A (FREI HANS) 4 February 1969 (1969-02-04) column 3, line 68 -column 4, line 62; figure 5 ---	1-10
X	GB 2 314 421 A (WERNER THOMAS) 24 December 1997 (1997-12-24) cited in the application the whole document -----	1,9,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir .ational Application No
PCT/GB 00/04745

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